

Trade Calculations – calculating timber quantities

Calculating Timber Quantities

You should be aware that timber is available in many different species. From Acacia to Zebrano with many thousands of species in between. Some are available in Australia, many are not. Some are cheap and are available in solid form. Some are expensive and so are converted to veneers for veneered particleboard.

Some useful species are best suited to outdoor use and some are not. The ability to choose the right timber for the job will determine whether the client receives the job that they ordered and that you as the maker have made a profit or loss.

By choosing the right material and ordering the correct quantity you will go a long way to ensuring that the business that you work in stays in business.

Introduction:

This workbook provides support for a number of timber trades course such as Off site Construction and Furnishing industry related courses in a logical step by step manner.

The sections are broken down into learning objects and are linked to the national competency standards as they relate to trade calculations. This way the workbook can be used as a teaching aid and also as a self-paced learning package.

The book contains work exercises linked to drawings and practical work associated with a range of trades. It also provides worked examples of trade related calculation problems and provides methods and formulae needed to solve the problems.

Learning Objects;

The learning objects at each stage will be clearly stated at the start of each section so that you clearly understand what it is you are expected to achieve.

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Common terminology

Nominal:	Nominal size refers to rough sawn timber and not its actual finished or dressed size.
Condition:	Refers to the finish on the surfaces of timber after surfacing
Milled	Timber that has a machined profile
Grade	Refers to the quality of the timber for example timber is either visually graded for appearance or stress graded for strength
Length	Timber is generally sold in standard lengths of 300mm increments for common species starting at 900mm approximately. So the next stock length would be 1200 then 1500 and so on.
Lineal metre	Timber measured along the length in the direction of the grain.
Cubic metres	Used when calculating bulk quantities of timber.

Trade Calculations – calculating timber quantities

LEARNING OBJECTS:

By completing this learning object you should have the skills and knowledge to gather, accurately measure and calculate timber materials for small joinery or furniture projects.

WRITING A TIMBER ORDER:

A timber order consists of several pieces of vital information.

They are:

- | | |
|--|-------------------------|
| 1. The number or (qty) of pieces of material | Eg. Say 6 pieces |
| 2. The length of each piece. | Eg. Say 2.7 metres each |
| 3. The "nominal size" or rough sawn section size. | Eg. Say 75mm X 25mm |
| 4. The condition of the timber. | Eg. Say D.A.R. or sawn |
| 5. The grade of the timber. | Eg. Say select grade |
| 6. The species of the timber | Eg. Tasmanian Oak |

This information can be written in many ways, depending on the quantity required. The following two examples are both correct, but are written differently.

Example 1. 6 / 2.7m 75 X 25 D.A.R. select grade Tas. Oak

Example 2. Tas. Oak D.A.R. select grade 6 / 2.7m 75 X 25

When ordering large quantities of timber, with timbers of the same species but with different section sizes it is common practice to group the common sizes together under one heading of species, condition, grade and section size, as can be seen in the following example.

Tasmanian Oak: rough sawn seasoned, select clears

100 x 50mm

6 / 4.2m 5 / 3.6m 12 / 3.3m 8 / 2.4m

75 x 38mm

12 / 3.3m 10 / 2.7m 9 / 2.1m

50 x 25mm

13 / 3.6m 11 / 3.0m

On the following page a range of timber orders have been written with built in mistakes.

Trade Calculations – calculating timber quantities

Find the mistake/s and write in the space available the name of the missing element/s in the timber order.

For example: 3.3m 150 x 50mm D.A.R. merchantable pine.

What information is missing? number of lengths

No	Sample timber orders	What information is missing?
1	24/ 3.6 Western Red Cedar 125 x 38mm	_____
2	rough sawn Oregon Merch. 100 x 50mm, 24	_____
3	2.4m bullnose architrave Pacific Maple	_____
4	American White Oak D.A.R. 12/ 3.3m 6/ 2.4m 3/ 2.1m	_____
5	colonial architrave 100 x 25mm 4/ 2.1m 1/1.8m	_____
6	28 pieces Silky Oak 100 x 50mm r/s select clears	_____
7	25/ 3.6m D.1.E. Calantis select clears	_____
8	clear grade , R/S 100 x 25mm	_____

The answers can be found on the following page.

Trade Calculations – calculating timber quantities

Answers to timber order problems from previous page.

1. Grade and condition
2. Length of pieces
3. Quantity required, grade and nominal size
4. Grade and nominal size
5. Species and grade
6. Length of pieces
7. Nominal size
8. Quantity and length of pieces and species.

Trade Calculations – calculating timber quantities

Multiple choice questions.

Place a X or ✓ in the square next to the your answer

1. Stress grading of timber indicates
 - a. the stress the timber is under ☐
 - b. the mechanical strength of timber ☐
 - c. the species of the timber ☐
 - d. the grade of the timber ☐
2. Milled timber is timber that is
 - a. dressed all round ☐
 - b. cut from a log ☐
 - c. machined with a specific profile. ☐
 - d. at the nominal size ☐
3. Boards are timber with a section size of between
 - a. 12mm to 38mm ☐
 - b. 25mm to 38mm ☐
 - c. 25mm to 50mm ☐
 - d. 38mm to 75mm ☐
4. timber with a nominal size of 75mm X 38mm will have a finished size of
 - a. 50mm X 30mm ☐
 - b. 60mm X 25mm ☐
 - c. 75mm X 38mm ☐
 - d. 66mm X 30mm ☐
5. Bull nose architrave is an example of
 - a. a timber joint ☐
 - b. a milled section ☐
 - c. a timber defect ☐
 - d. grade of timber ☐

You can find the answers to these questions on the following page

Trade Calculations – calculating timber quantities

Answers to multiple choice questions.

1. b. 2. c. 3. a. 4. d. 5. b.

Trade Calculations – calculating timber quantities

Calculating timber quantities

Let's begin by refreshing our memories about timber sizes, grades and conditions by working through the following exercise.

Fill in the missing words.

No

- 1 Small quantities of timber are sold by the _____
- 2 Large quantities of timber are sold by the _____
- 3 Timber that has been dressed on all faces is said to be _____
- 4 The term "_____" size refers to timber in it's rough sawn state
- 5 Timber sold by the metre is priced by the rough sawn "_____" size
- 6 Furniture grade timbers with less than 10% defects is known as _____ grade of timber.
- 7 F4 grade to F8 grade of timber are best suited to _____ work.
- 8 F11 grade to F17 grade of timber are best suited for _____ work.

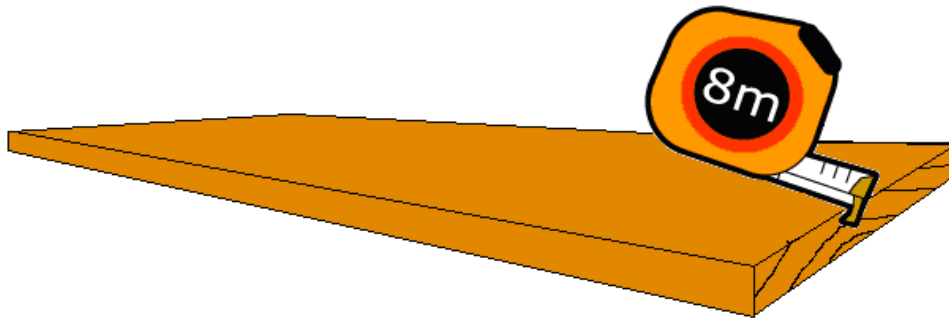
You can find the answers on the following page, but try and work them out for yourself first.

Trade Calculations – calculating timber quantities

Answers to questions from the previous page.

- | | |
|--------------------------------------|---|
| 1. Lineal metre | 2. Dressed all round |
| 3. Nominal | 4. Cubic metre |
| 5. Nominal size | 6. Select grade |
| 7. Building work (wall framing etc.) | 8. Engineering (beams, piles, wharves, electrical poles) |

Remember, the length is measured in the direction of the grain.



Trade Calculations – calculating timber quantities

When calculating timber quantities we multiply the number of pieces by the length of each piece.

That is quantity X by the length.

Here are some examples of timber orders written in different ways. The quantities and lengths have been high lighted for easy identification.

example 1. F5 Oregon seas. 75 x 38mm **25 / 3.6** = 25 x 3.6
total timber quantity = 90 metres

example 2. **16 / 2.7** 100 x 38 mm R.S. kiln dried Tasmanian Blackwood
total timber quantity = 43.2 metres

example 3. un seas. F11 Nth coast H'wood 150 x 50mm **12 / 3.6**
total timber quantity = 43.2 metres

Exercise 1. Calculate the total timber quantities from the list of timber orders given below.

Question	Answer
1. 24 / 3.3 150 x 25mm seas. Tasmanian Oak D.A.R. select grade.	<hr/>
2. 100 x 38mm rough sawn seasoned Calantis clear grade. 6 / 2.1 13 / 2.4 22 / 3.3 10 / 3.9	<hr/>
3. Western red cedar 175 x 25mm colonial skirting. 12 / 4.2 21 / 4.8	<hr/>
4. Pacific maple seasoned select merch. 125 x 50 mm door jamb (single rebate). 10 / 2.1 5 / 1.8	<hr/>
5. 50 x 38 mm kiln dried N.Z. Beech clear grade 35 / 2.1 13 / 1.8 6 / 1.5 26 / 3.3 D.A.R.	<hr/>

You can find the answers to these questions on the next page , but try and work them out for yourself first.

Trade Calculations – calculating timber quantities

Answers to the questions from the previous page.

1. 79.2 metres
2. 155.4 metres
3. 151.2 metres
4. 30 metres
5. 191.7 metres

Trade Calculations – calculating timber quantities

COSTING A TIMBER ORDER:

Costing a timber order is the next step. Once you have worked out the total timber quantities in the order, it is a simple matter of multiplying the total timber quantity by the price (\$) given per metre. See the following examples as to how it works.

Example 1: 16 / 3.3 150 x 38 mm Kauri Pine D.A.R. clear grade seas.

$$\text{Price} = \$ 17.63 / \text{metre}$$

$$= (16 \times 3.3) \times \$ 17.63$$

$$= 52.8 \text{ m} \times \$ 17.63$$

$$= \$930.86$$

Try and cost the following samples. Show all the working out.

1. 15 / 3.6 150 x 38mm R.S. Tas. Oak select @ \$27.50 / m

answer : _____

2. 28 / 2.7 75 x 25mm D.A.R. Rad. Pine f 5 grade @ \$4.35 / m

answer : _____

3. 100 x 25mm N.Z. Beech clear grade D.D. @ \$9.50 / m

12 / 3.6 12 / 2.1 16 / 4.2 3 / 3.9

answer : _____

You can find the answers on the next page.

Trade Calculations – calculating timber quantities

Here are the answers to the questions from the previous page.

1. \$1,485.00

2. \$328.86

3. \$1,399.35

Trade Calculations – calculating timber quantities

Calculating timber quantities and cost

Now try combining the information you have to solve the timber calculation problems in the question below.

Q1 Calculate the total metres of timber required to construct fifteen [15] Partition Frames.

Material: 75mm x 50mm D.A.R. Pine.

Quantity required for one [1] frame is:

2/3.9m 4/1.2m 6/2.4m

_____ = _____

_____ = _____

_____ = _____

total = _____ x _____ = _____

Q2 Calculate the total metres of timber required to construct eighteen [18] Partition Frames.

Material: 75mm x 50mm D.A.R. Pine.

Quantity required for one [1] frame is:

8/3.6m 14/1.2m 6/2.7m

_____ = _____

_____ = _____

_____ = _____

total = _____ x _____ = _____

Trade Calculations – calculating timber quantities

Q3 Calculate the total metres of timber required to construct five [5] Partition Frames.

Material: 75mm x 50mm D.A.R. Pine.

Quantity required for one [1] frame is:

7/3.3m 4/1.8m 16/2.1m

_____ = _____

_____ = _____

_____ = _____

total = _____ x _____ = _____

Q4 Calculate the total metres of timber required to construct ten [10] Partition Frames.

Material: 75mm x 50mm D.A.R. Pine.

Quantity required for one [1] frame is:

12/0.9m 6/1.2m 10/2.4m

_____ = _____

_____ = _____

_____ = _____

total = _____ x _____ = _____

Q5 Calculate the total metres of timber required to construct three [3] Partition Frames.

Material: 75mm x 50mm D.A.R. Pine.

Quantity required for one [1] frame is:

18/1.5m 23/1.8m 6/2.1m

_____ = _____

_____ = _____

_____ = _____

total = _____ x _____ = _____

Q6 Calculate the total metres of timber required to construct nine [9] Partition Frames.

Material: 75mm x 50mm D.A.R. Pine.

Quantity required for one [1] frame is:

5/2.7m 11/1.2m 16/2.4m

_____ = _____

_____ = _____

_____ = _____

total = _____ x _____ = _____

Costing the timber order

Trade Calculations – calculating timber quantities

Q7 Calculate the cost of the timber order below, given Oregon costs \$3.50 per metre

100 x 50 DAR Oregon	27/3.3m	12/2.4m
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Q8 Calculate the cost of the timber order below, given Maple costs \$3.80 per metre

75 x 35 DAR Maple	17/3.6m	22/2.7m
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Trade Calculations – calculating timber quantities

Q9 Calculate the cost of the timber order below, given Oregon costs \$2.20 per metre

40 x 19 DAR Oregon 7/3.9m 2/2.1m

Q10 Calculate the cost of the timber order below, given Ash costs \$2.90 per metre

65 x 19 DAR Ash 47/4.8m 18/1.2 m

Q11 Calculate the cost of the timber order below, given Pine costs \$1.50 per metre

40 x 12 DAR Pine 17/0.9m 8/1.2m

Q12 Calculate the cost of the timber order below, given Pine costs \$2.75 per metre

75 x 35 DAR Pine 38/3.6m 5/2.7m

Q13 Calculate the cost of the timber order below, given Oregon costs \$6.50 per metre

150 x 75 DAR Oregon 12/5.4m 27/5.1m

Q14 Calculate the cost of the timber order below, given Ash costs \$7.25 per metre

110 x 32 DAR Ash 15/1.8m 8/1.2 m

Trade Calculations – calculating timber quantities

Q15 Calculate the cost of the timber order below, given Pine costs \$3.44 per metre

40 x 12 DAR Pine 37/0.6m 8/1.8m

Q16 Calculate the cost of the timber order below, given Pine costs \$2.35 per metre

75 x 35 DAR Pine 18/3.6m 15/2.7m

Q17 Calculate the cost of the timber order below, given Oregon costs \$9.50 per metre

150 x 75 DAR Oregon 13/5.4m 17/5.1m

Q18 Calculate the cost of the timber order below, given Ash costs \$7.85 per metre

110 x 32 DAR Ash 25/1.8m 18/1.2 m

Q19 Calculate the total metres of timber required to construct ten [10] Partition Frames.

Material: 75mm x 50mm D.A.R. Pine.

Quantity required for one [1] frame is:

12/3.9m 16/1.5 m 11/2.7m

_____ = _____

_____ = _____

_____ = _____

total = _____ x _____ = _____

Trade Calculations – calculating timber quantities

Q20 Calculate the total metres of timber required to construct three [3] Partition Frames.

Material: 75mm x 50mm D.A.R. Pine.

Quantity required for one [1] frame is:

8/1.8m 3/4.8m 6/2.7m

_____ = _____

_____ = _____

_____ = _____

total = _____ x _____ = _____

Q21 Calculate the total metres of timber required to construct nine [9] Partition Frames.

Material: 75mm x 50mm D.A.R. Pine.

Quantity required for one [1] frame is:

15/2.4m 8/4.2m 6/2.7m

_____ = _____

_____ = _____

_____ = _____

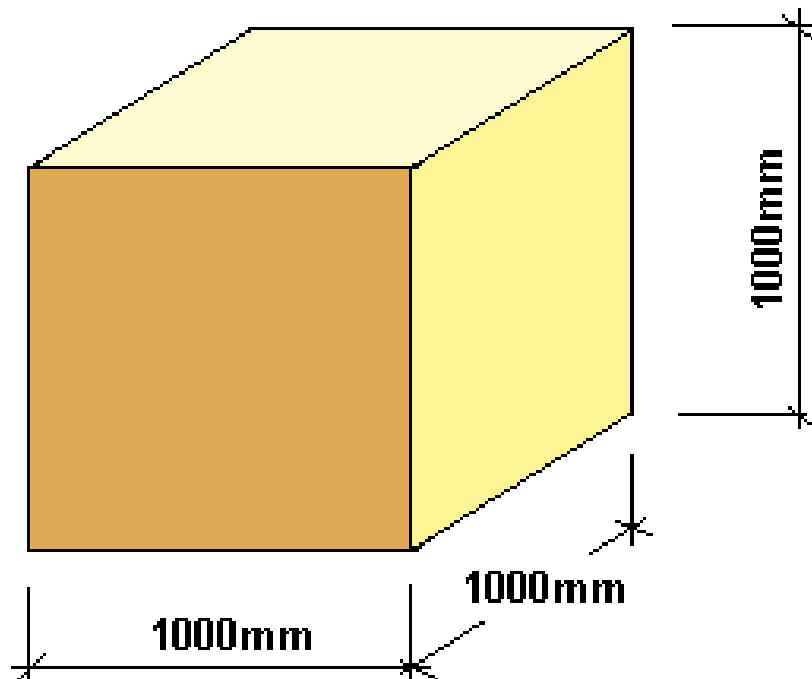
total = _____ x _____ = _____

Trade Calculations – calculating timber quantities

COSTING CUBIC METRES

Timber is also sold by the cubic metre, particularly large quantities. This gives you a standard rate for that species and grade no matter what the section size is. For example a cubic metre of radiata pine will cost \$1750.00. What we need to be able to do is to convert the cubic metre rate into a lineal metre rate. A cubic metre of timber is a block of timber that measures

1m long x 1m wide x 1m thick. It looks like this:

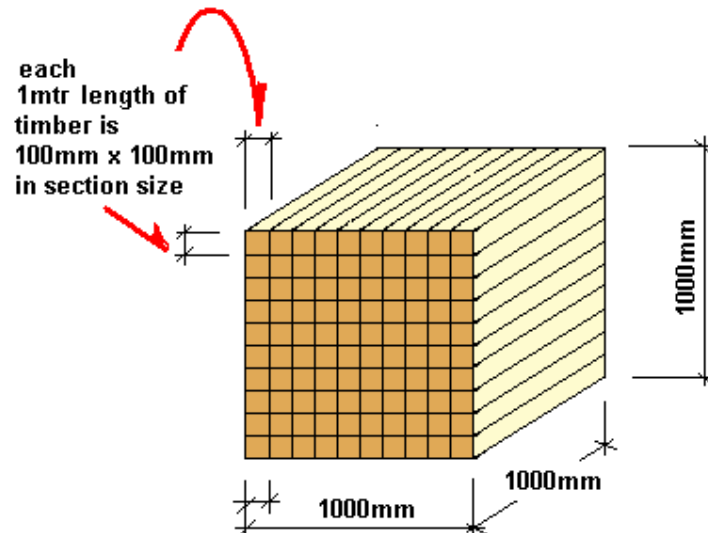


Trade Calculations – calculating timber quantities

If you were to take a saw and split the block of timber into pieces of a certain section size you end up with a certain number of lineal metres as can be seen in the following example.

Not to scale

Nominal size of material is 100mm x 100mm.



Therefore there are 100 mtrs of 100 x 100mm section size in each cubic metre

How is it done?

Step 1.

Divide the width of the section size into 1000mm and the thickness of the section size into 1000mm.

Step 2.

You then multiply the two answers to see how many pieces can be obtained from a square metre. This is the number of lineal metres available for that section size from a cubic metre.

On the next page you can see how the calculations work.

Choosing a simple section size of 100mm x 100mm.

$1000\text{mm} \div 100\text{mm} = 10$ (this is 1 metre divided by the nominal width)

$1000\text{mm} \div 100\text{mm} = 10$ (this is 1 metre divided by the nominal thickness)

Now; $10 \text{ in width} \times 10 \text{ in thickness} = 100$

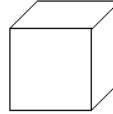
or 100 lineal metres.

Try the examples on the following pages.

Trade Calculations – calculating timber quantities

Exercise 1. Try breaking this cubic metre into a section size of 50mm x 25mm. Use your scale rule to construct a cube 100mmm x 100mm x 100mm deep from the given corner (A).to look similar to the one shown here.

Note the depth of the box is actually drawn in half scale size so 100mmm = 50mm. The angle is 45°



A

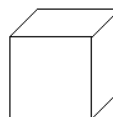
Remember, only break up one (1) face!

Questions:

1. How many pieces 50mm wide can be cut from the width? _____
2. How many pieces 25mm thick can be cut from the thickness? _____
3. How many lineal metres of 50 x25mm material can be cut from the cubic metre?

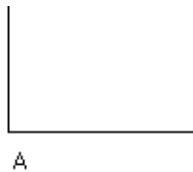
Use your scale rule to construct a cube 100mmm x 100mm x 100mm deep from the given corner (A).to look similar to the one shown here.

Note the depth of the box is actually drawn in half scale size so 100mmm = 50mm. The angle is 45°



Trade Calculations – calculating timber quantities

Exercise 2. In this exercise, work out the total number of lineal metres of section size 75mm x 50mm material available from a cubic metre.



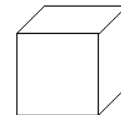
Questions:

4. How many pieces at 75mm can be cut from the width of the block? _____
5. How many pieces at 50mm can be cut from the thickness of the block? _____
6. How many lineal metres of 75mm x 50mm material can be obtained from a cubic metre? _____

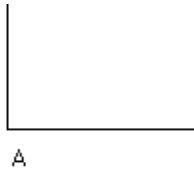
Exercise 3. In this exercise work out the total number of lineal metres of 50mm x 50mm material available from a cubic metre.

Use your scale rule to construct a cube 100mm x 100mm x 100mm deep from the given corner (A).to look similar to the one shown here.

Note the depth of the box is actually drawn in half scale size so 100mm = 50mm. The angle is 45°



Trade Calculations – calculating timber quantities



Questions:

7. How many pieces 50mm wide can be cut from the width? _____

8. How many pieces 50mm thick can be cut from the thickness? _____

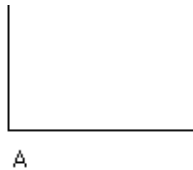
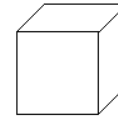
9. How many lineal metres of 50 x 50mm material can be cut from the cubic metre? _____

Trade Calculations – calculating timber quantities

Exercise 4. In this exercise work out the total number of lineal metres of section size 250 x 25mm material available from a cubic metre

Use your scale rule to construct a cube 100mm x 100mm x 100mm deep from the given corner (A).to look similar to the one shown here.

Note the depth of the box is actually drawn in half scale size so 100mm = 50mm. The angle is 45°



Questions:

10. How many pieces at 250mm wide can be cut from the block?_____

11. How many pieces at 25mm thick can be cut from the block?_____

12. How many lineal metres of 250 x 25mm material can be cut from the cubic metre?_____

Answers to the questions can be found on the next page, but try doing them yourself first.

Trade Calculations – calculating timber quantities

Answer to the questions from the previous 3 pages.

1. 20 pieces
2. 40 pieces
3. $20 \times 40 = 800$ lineal metres
4. 13 pieces (or accurately 13.33 pieces)
5. 20 pieces
6. $20 \times 13 = 260$ lineal metres (accurately, $20 \times 13.33 = 266.6\text{m}$)
7. 20 pieces
8. 20 pieces
9. $20 \times 20 = 400$ lineal metres
10. 4 pieces
11. 40 pieces
12. 160 lineal metres

Trade Calculations – calculating timber quantities

WORKING OUT THE COST:

To work out the cost per lineal metre of timber from the cubic metre rate it is simply a matter of dividing the cubic metre rate by the total number of lineal metres of the section size available from a cubic metre.

For example in the first example we worked out that if the section size is 100mm x 100mm then we get 100 lineal metres of timber from the cubic metre.

So, dividing the cubic metre rate of \$2,550.0 by 100 and we get a lineal metre rate for the 100mm x 100mm timber of \$25.50/m.

Try working out the cost per lineal metre for the exercises you have just completed. Use the answers you have already obtained to do the working out.

Exercise 1.

The section was 50mm x 25mm. The species is Australian Red Cedar. The rate per cubic metre of select grade, R/S, is \$3,750.00.

Answer: _____

Exercise 2.

The section size is 75mm x 50mm. The species is Oregon. The rate per cubic metre for F7 grade R/S Oregon is \$2,975.00.

Answer: _____

Exercise 3.

The section size is 50mm x 50mm. The species is Tasmanian Oak, clear grade, R/S. The rate per cubic metre is \$3,125.00.

Answer: _____

Exercise 4.

The section size is 250mm x 25mm. The timber is clear grade, R/S Tasmanian Blackwood. The rate per cubic metre \$3,125.00.

Answer: _____

Trade Calculations – calculating timber quantities

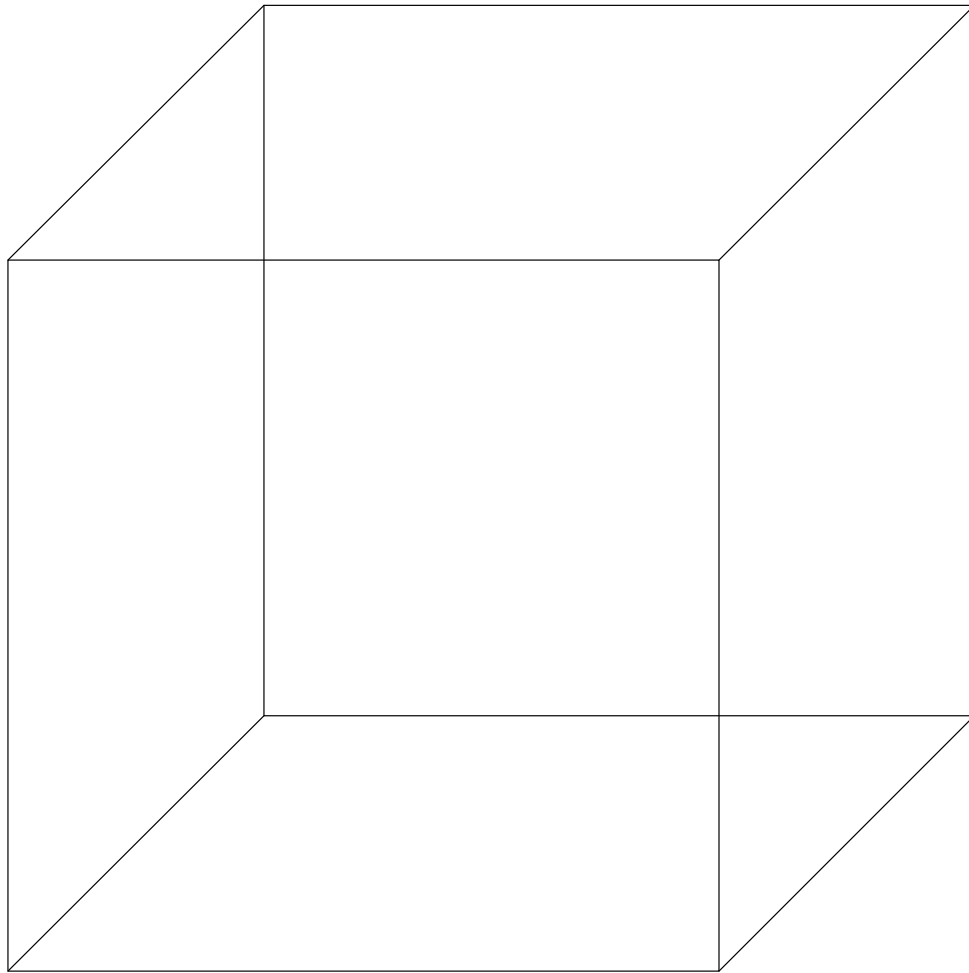
Exercise 5

Here is an exercise you have not attempted before. You are required to work out:

- (a) the total lineal metres from a cubic metre
- (b) The rate per lineal metre for the timber.

The timber is R/S Philippine Mahogany, select grade 150mm x 75mm.

The rate per cubic metre for the timber is \$3,275.00.



Trade Calculations – calculating timber quantities

The answers are on the following page, but try working them out for yourself first before checking.

Answers the exercises on the previous page.

Exercise 1. \$4.69 / metre. (actual \$4.6875 / metre)

Exercise 2. \$11.16 / metre (actual \$11.15625 / metre)

Exercise 3. \$7.81 / metre (actual \$7.8125 / metre)

Exercise 4. \$19.53 / metre (actual \$19.53125)

Exercise 5. \$36.84 / metre (actual \$36.84375)